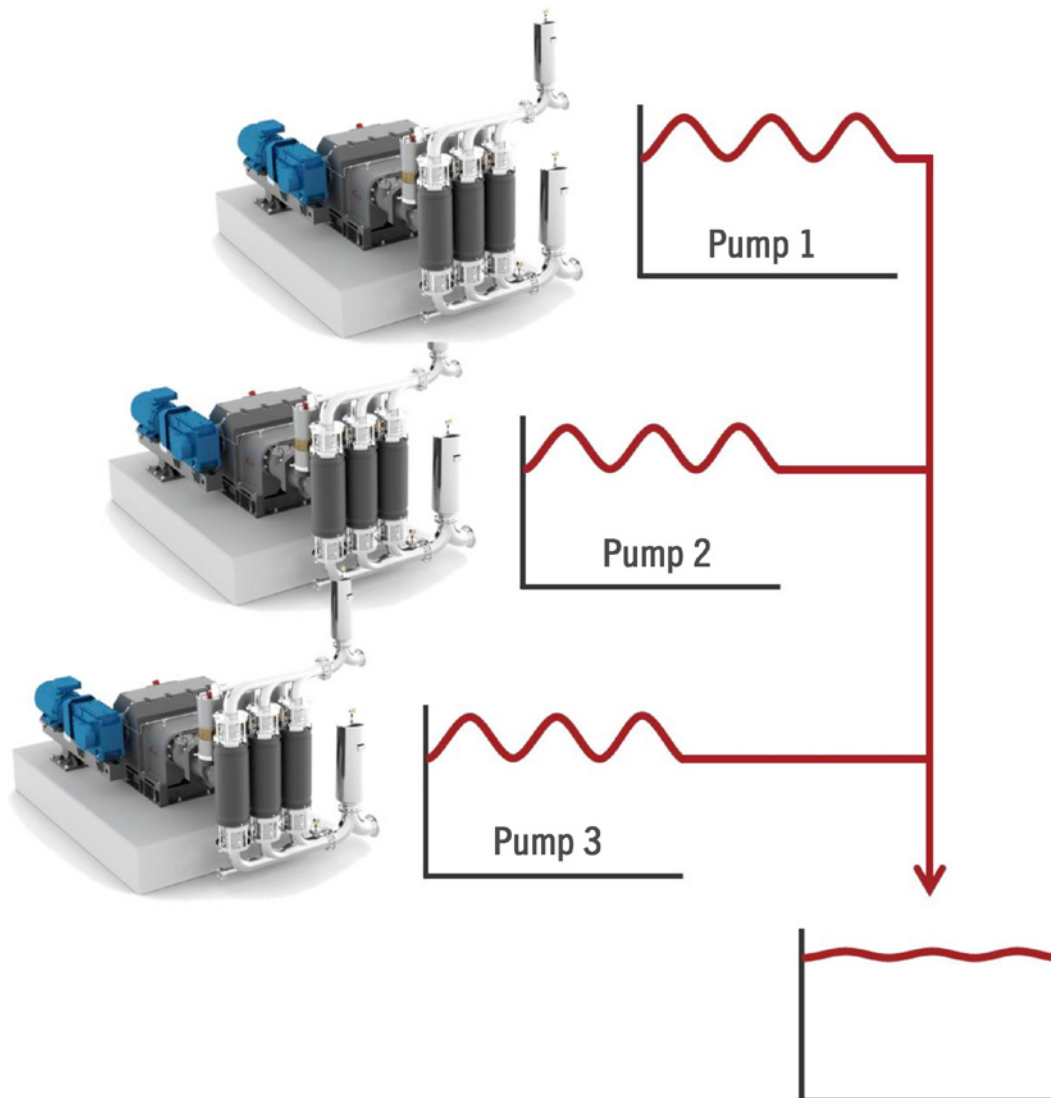


# MULTISAFE Double Hose-Diaphragm Process Pump

## *Multiple Pump Control System*



### Multiple Pump Control System

Running multiple hose-diaphragm pumps in parallel is a common method to increase or reach the required capacity. However, due to the motion of crankshaft and pistons resulting in suction and discharge stroke, flow is not constant. Using a triplex pump with three heads, each piston has a phase shift of  $120^\circ$  and the resulting flow curve of the three heads is shown in Fig. 1 (green curve). The remaining flow irregularity is about 23 %, not taken into account any pulsation dampener or damping by gas content in hydraulic liquid or medium.

Fig. 1 likewise shows the flow figure for three triplex pumps running in parallel, i.e. pumping into the same discharge pipe. The upper curve shows the resulting flow curve when the pumps run without phase shifting. The relative irregularity is the same as for a single pump, but at a higher flow level.

The situation changes dramatically when three pumps are running with an optimum phase shift, i.e.  $40^\circ$  for the second pump and  $80^\circ$  for the third pump (Fig. 2). Maxima and minima compensate each other and the undamped irregularity on the common discharge pipe reduces more than 10 times to 2.2 %. The more pumps discharge into the same pipeline or process, the more important this Multiple Pump Control System becomes. Multiple Pump Control adjusts the phase shift of the pumps and can also change the phase shift, if one of the pumps is switched off. The phase shift is detected by a sensor for the crankshaft position in each pump. The reduction of the flow irregularity assures a smoother operation of the pipeline and increases significantly lifetime of the valves.

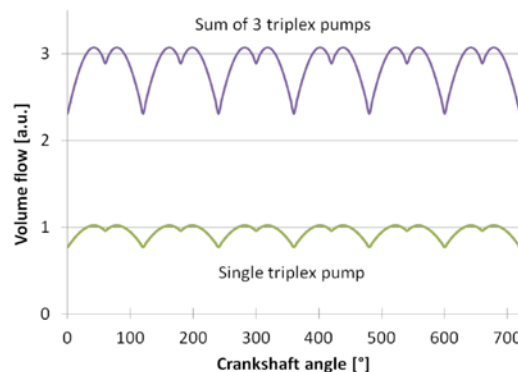


Fig. 1

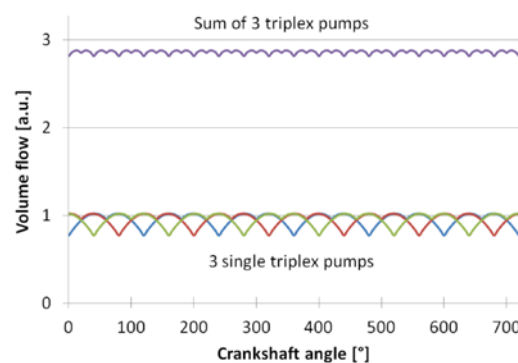


Fig. 2